ANNUAL SITE ENVIRONMENTAL REPORT
for
CALENDAR YEAR 1994

Safety and Security Office,
Environmental Engineering Section

National Renewable Energy Laboratory
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List of Acronyms

AFUF	Alternative Fuels User Facility
APEN	Air Pollution Emission Notice
BTRF	Biotechnology Research Facility
CAA	Clean Air Act
CDPHE	Colorado Department of Public Health and Environment
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CFR	Code of Federal Regulations
CWA	Clean Water Act
DOE	Department of Energy
DOE/CH	Department of Energy/Chicago Operations Office
DOE/GO	Department of Energy/Golden Field Office
DWOP	Denver West Office Park
EPA	Environmental Protection Agency
EH	DOE Office of Environment, Safety and Health
EPA	Environmental Protection Agency
ES&H	Environment, Safety and Health
ESA	Endangered Species Act
FETA	Field Experimental Test Area
FIFRA	Federal Insecticide, Fungicide and Rodenticide Act
FONSI	Finding of No Significant Impact
FTLB	Field Test Laboratory Building
JSF	Joyce Street Facility
MISR	Modular Industrial Solar Retrofit
MSDS	Material Safety Data Sheet
MSW	Municipal Solid Waste
MW	Monitoring Well
MWRD	Metro Wastewater Reclamation District
NEPA	National Environmental Policy Act
NESHAP	National Emission Standards for Hazardous Air Pollutants
NPDES	National Pollutant Discharge Elimination System
NREL	National Renewable Energy Laboratory
NWTC	National Wind Technology Center
OSHA	Occupational Safety and Health Administration
OTEC	Ocean Thermal Energy Conversion
OTF	Outdoor Test Facility
PCB	Polychlorinated Biphenyls
PDU	Process Demonstration Unit
PIT	Process Improvement Team
PM10	Particulate Matter (10 microns or less)
POTW	Publicly Owned Treatment Works

PVWSD	Pleasant View Water and Sanitation District
QA	Quality Assurance
QC	Quality Control
RCRA	Resource Conservation and Recovery Act
RQ	Reportable Quantity
SARA	Superfund Amendment and Reauthorization Act
SDWA	Safe Drinking Water Act
SERC	State Emergency Response Commission
SERF	Solar Energy Research Facility
SERI	Solar Energy Research Institute
SOP	Safe Operating Procedure
SPPP	Stormwater Pollution Prevention Plan
SQG	Small Quantity Generator
SRRL	Solar Radiation Research Laboratory
SSO	Safety and Security Office
SSO-EES	Safety and Security Office, Environmental Engineering Section
STM	South Table Mountain
TCLP	Toxicity Characteristic Leaching Procedure
TLD	Thermoluminescence Dosimeter
TOC	Total Organic Carbon
TOX	Total Organic Halogen
TPQs	Threshold Planning Quantities
TSCA	Toxic Substance Control Act
TSD	Treatment, Storage and Disposal
UMTRA	Uranium Mill Tailings Remedial Action
VOC	Volatile Organic Compound
WPA	Works Progress Administration

1.0 EXECUTIVE SUMMARY

This report presents summary environmental data and information to characterize site environmental management performance, confirm compliance with environmental standards and requirements, and highlight significant environmental programs and achievements at the National Renewable Energy Laboratory (NREL). In addition, the report will document efforts by NREL to minimize operational risk by surpassing the requirements.

NREL is the nation's primary laboratory for research on the development of economically viable renewable energy technologies. Because NREL's research activities, unlike typical manufacturing operations, do not generate large quantities of routine effluents or emissions, NREL is not required by the U.S. Environmental Protection Agency (EPA) or the State of Colorado to perform environmental monitoring of its effluents or emissions. However, EPA and the State of Colorado do require that NREL hold certain permits, and NREL must comply with applicable Federal and State requirements as described below.

NREL has performed monitoring of its groundwater quality and its wastewater effluent. In addition, the Laboratory conducted short-term particulate ambient air monitoring and surfacing water storm (storm water) monitoring in 1992 as required by the U.S. Department of Energy (DOE). All environmental monitoring conducted at NREL is performed in accordance with its Environmental Monitoring Plan (NREL 1994). Most of NREL's monitoring to date has been baseline monitoring. Baseline environmental monitoring is performed to establish environmental conditions prior to significant activity in an area. Baseline data is used as a measure against which to compare future environmental monitoring data to assess the impacts of human activity on the environment. In this case, the baseline data can be used to assess any potential impacts of NREL's activities should any environmental problem be suspected. At this point, no future routine environmental monitoring is planned at NREL.

The majority of NREL's research and development activities are conducted on a laboratory scale using only smaller quantities of various chemicals, primarily organic compounds, acids, and bases, in nonroutine manner. There are no manufacturing or industrial operations at NREL. Because of this very limited and nonroutine use of chemicals, any air emissions produced by the facility's laboratories are sporadic with small-quantity emissions consisting primarily of volatile organic vapors. The State of Colorado has primacy in implementing air regulations, and NREL's laboratory air emissions are exempt from permitting by Regulation No. 3, Air Pollutant Emission Notices. Air emissions from two of NREL's seven gas-burning boilers have been permitted (initially permitted in 1983 and 1988). As a result of a revision to the regulations in 1993, all of NREL's boilers are not exempt from permitting due to their small size, although the two existing NREL permits were not rescinded automatically by regulation.

The EPA requires all DOE facilities to demonstrate compliance with the radionuclide emission limit established in 40 CFR 61, Subpart H, National Emission Standards for Hazardous Air Pollutants. This limit specifies that air emissions of radiation must not exceed an amount that would result in an effective dose of 10 mrem/yr to any member of the public. Radioisotopes at NREL are used in minute amounts in only a few laboratories for biological labeling purposes. NREL's radionuclide inventory for calendar year 1994 is less than 8.4 mCi. Given the limited inventory and the sporadic use of radionuclides, emissions

monitoring is not conducted at NREL. NREL demonstrated compliance with the radionuclide emission limit of 10 mrem/yr by using the EPA-approved COMPLY computer model. This model calculated that the 1994 potential does to the nearest member of the public was 0.0015 mrem/yr, well below the limit.

There are two X-ray diffraction machines at NREL at the Solar Energy Research Facility (SERF) on the South Table Mountain (STM) site. These machines are inspected every 2 years by a state-licensed surveyor in accordance with Colorado Department of Public Health and Environment (CDPHE) radiation safety procedures. NREL's X-ray machines were recertified in 1995 for another 2 years. There are also two sealed gamma ray level sensors located in the AFUF, and a sealed cesium source in storage in the FTLB.

NREL is currently classified as a nonindustrial water user by the local sewer district. Consequently, NREL is not required to obtain a permit for its wastewater effluent, nor is it required by EPA, the State of Colorado, or the local sewer district to monitor its effluent at this time. NREL has no point-source discharges to the environment, so a National Pollutant Discharge Elimination System (NPDES) permit is not required for its normal operations; however, NREL filed a Notice of Intent with EPA for sitewide coverage under the General Permit for Stormwater Discharge Associated with Construction Activity for construction activities on its National Wind Technology Center (NWTC) site. This coverage began in July of 1994.

NREL has four separate Resource Conservation and Recovery Act (RCRA) waste generator identification numbers issued by the State of Colorado. In calendar year 1994, NREL disposed of 3180 kg of hazardous waste and 2287 kg of nonregulated waste (excluding sanitary waste) from laboratories and facilities maintenance activities of out-of-state, EPA-permitted treatment, storage, and disposal facilities.

The results of 4 years of groundwater monitoring continue to indicate that there is no significant contamination of the groundwater beneath the STM site, as it has met both federal and state drinking water and groundwater standards during each sampling event with only one exception. Based on the uncontaminated nature and slow flow rates of the groundwater, groundwater monitoring has been discontinued.

2.0 INTRODUCTION

The purpose of this report is to present summary environmental data and information to characterize site environmental management performance, confirm compliance with environmental standards and requirements, and highlight significant environmental programs and achievements at the National Renewable Energy Laboratory (NREL). In addition, the report will document efforts by NREL to minimize operational risk by surpassing the requirements. The report has been prepared in accordance with the requirements of U.S. Department of Energy (DOE) 5400.1.

2.1 NREL Mission and Principal Activities

The Solar Energy Research Institute (SERI) was created in 1977 as the nation's primary laboratory dedicated to the research and development of economically viable solar and renewable energy technologies, and to facilitating the commercialization of these technologies. On September 16, 1991, SERI was designated at the National Renewable Energy Laboratory. NREL employs more than 900 full-time staff. The Laboratory is operated for DOE's Office of Energy Efficiency and Renewable Energy by the Midwest Research Institute of Kansas City, Missouri. Major research at NREL is conducted in the broad areas of photovoltaics, alternative fuels, industrial technologies, wind technology, basic sciences, analytic studies, building and energy systems, utility programs and transportation programs.

In the area of utility technologies, specific disciplines under study at NREL include the following: photovoltaics, which is the direct conversion of sunlight to electricity using solid-state materials; wind energy; solar thermal electric, which explores ways to convert the sun's thermal energy into electricity; biomass electric, in which electricity is produced from biomass resources; ocean thermal energy conversion, which uses the temperature difference between warm ocean surface water and cold deep water to drive a heat engine, in turn generating electricity; and superconductivity research, such as the development of new deposition methods for thin-film superconductors. Hydrogen is used extensively in industry for chemicals, food processing, and oil and gas processing. NREL manages a DOE program to produce hydrogen from renewable energy sources.

Industrial technologies applications that are the subject of NREL research include the following: solar thermal detoxification, which involves the development of methods that use the sun's energy to destroy hazardous waste and process materials; waste management activities, which involve finding better methods to convert waste materials to useful products and methods to convert waste to energy; and bio-based materials and plastics recycling, which involves the identification of new materials that are either completely biologically based or a combination of biologically-based and synthetic materials that perform as well as conventional metals and plastics.

NREL research is also directed toward transportation technologies. The goal of the Biofuels Program is to develop technologies for converting biomass materials to alternative transportation fuels such as ethanol and methanol. The Alternative Fuels Utilization Program is establishing a base for using such fuels in both conventional and advanced heat engines.

The focus of building technologies research at NREL is on the development of advanced perimeter thermal control systems to reduce building heating, cooling, lighting and ventilation loads.

NREL also conducts research directed at artificial photosynthesis, basic photoelectrochemistry, modified semiconductor electrodes, and synthesis of novel organometallic compounds useful as catalysts for photoconversion processes. These studies have a goal of producing useful fuels and chemicals using direct, sunlight-driven chemical reactions.

Another energy-related research activity at NREL is the Municipal Solid Waste (MSW) Program. The program goal is to make productive use of MSW as an energy resource by creating alternative fuels (for example, oils and alcohols) from the waste.

2.2 Site and Facility Description

NREL facilities occupy four separate locations in Jefferson County, Colorado, near the city of Denver. The four facilities are the Denver West Office Park (DWOP), the South Table Mountain (STM) site, the Joyce Street Facility (JSF), and the National Wind Technology Center (NWTC). The DWOP and STM sites are approximately 2 miles east of Golden and 12 miles west of central Denver. The NWTC is approximately 15 miles north of the STM site. The JSF is located at 6800 Joyce Street, approximately 5.5 miles north of the DWOP and STM sites. Figure 2.1 illustrates the locations of the four sites on a regional map. Figure 2.2 provides a more detailed map of the DWOP and STM sites, and Figure 2.3 gives a more detailed map of the NWTC site. Responsibility for site management at the NWTC was transferred to the DOE Golden Field Office (GO) in July 1993.

2.3 Environmental Features

2.3.1 Historical/Cultural Resources

Two formal surveys of historical and cultural resources at the STM site have been performed. The first was an archaeological study conducted in 1980 by Dr. Sarah M. Nelson, Associate Professor of Anthropology at the University of Denver. The second study was a historical review completed by the FORUM Associates, Inc. in 1987 (1987b) in support of the 1988 update to NREL's site-wide environmental assessment (NREL 1993a).

Three historical sites at the STM site were recognized by the studies as significant cultural resources that should be preserved. These sites include an open-air ampitheatre, a stone bridge spanning a natural drainage channel adjacent to the ampitheatre, and a stone and concrete ammunition bunker below the ampitheatre site. The three structures were constructed during the Works Progress Administration (WPA) era in the 1930s, and their nomination to the National Register of Historic Places and the Colorado Register of Historic Places was approved in 1993 by the federal and state preservation boards. A complete *Cultural Resource Management Plan* was prepared to ensure the protection of the historic structures on the STM sites. A survey of historic and cultural resources was conducted at the NWTC in 1994. No significant historic or cultural resources were identified.

Figure 2.1 Regional Map

Figure 2.2 Detailed Map of Denver West Office Park and South Table Mountain

Figure 2.3 Detailed Map of National Wind Technology Center

2.3.2 Geology and Hydrogeology

South Table Mountain is a mesa that stands about 150 m above the adjacent lowlands. It was formed by the erosion of weak sedimentary rocks surrounding the mesa's erosion-resistant lava cap. The STM site is a roughly triangular parcel of land occupying portions of the top, sides and lower south-facing slopes of South Table Mountain. The Table Mountains are composed of flat-lying, poorly cemented sedimentary rocks capped with Table Mountain Shoshonite basalt lava flows (part of the Denver Formation), which are quite resistant to erosion. It is the much slower erosion of these lava caprocks that protects the softer rocks underneath and has produced the mesa landforms. Below the lava caprock, the Denver Formation consists of 131-m sequence of stratified lenses of claystone, sandstone, and conglomerate from 0.3m to 3m in thickness. The Denver Formation underlies the areas on which most NREL construction has taken place. A 3650-m sequence of sedimentary rocks underlies the Denver Formation. Although none have been found on the STM site, fossils of plants, dinosaurs, fish, turtles, and crocodiles have been found in the Denver Formation. The Denver Formation and the underlying Arapahoe Formation, which occurs at a depth about 152 m below the mesa top, are both considered to be aquifers in portions of the Denver Basin. Groundwater on the STM site occurs primarily in the weathered and fractured silts and sands of the Denver Formation. It is likely that there is also some groundwater in the form of perched aquifers below the basaltic lava cap on South Table Mountain and within the alluvial/colluvial materials above the Denver Formation. Groundwater flow on the site is in a southeasterly direction. (U.S. Department of Energy 1993)

The NWTC site is located on an alluvial plain. Surface deposits consist of alluvium, colluvium, and valley fill alluvium. The uppermost deposit, known as the Rocky Flats Alluvium (RFA), is about 40 feet thick beneath the wind site, thinning to the east. It is composed of cobbles, coarse gravel, sand, and gravelly clay. Below the RFA is the Laramie Formation, which is about 900 feet thick below the NWTC; the Fox Hills Sandstone, which is about 75 feet thick; and the Pierre Shale. Bedrock underlying the alluvium consists primarily of claystones with some siltstones. Unconfined groundwater flow occurs in the RFA toward the east/southeast, and small perched zones are common. Groundwater occurs as confined aquifers in the deeper bedrock formations (EG&G Rocky Flats, Inc. 1992).

2.3.3 Surface Hydrology

The STM site normally received about 15 inches of precipitation per year. Most of this precipitation is in the form of rainfall during the period from April through early fall. The monthly precipitation during this warm season is from 3 cm to 8 cm (1 in to 3 in). Most of the significant runoffs occurs when 0.76 cm (0.3 in) or more of precipitation falls within a short period of time.

Precipitation from November to March is normally in the form of snow. Little snow accumulates during the winter season because of the large amount of solar radiation and the exposure to dry winds, which melt or sublimate the snow. Very little snow becomes surface runoff.

Figure 2.4 Drainage Basins at South Table Mountain Site

The drainage pattern from the site, including hydrologic subbasins, is shown in Figure 2.4 About 90% of the surface drainage off the site, both on the mesa top and across the lower portions of the site, is in a southerly direction toward Lena Gulch (a tributary of Clear Creek). Two drainageways on the easternmost portion of the site are intercepted by the Welch Ditch, which ultimately flows into Lena Gulch.

The soils and vegetative cover are important factors in determining the amount of rainfall that infiltrates or is lost from the immediate surface runoff. Predominant soils in the area are composed of silts and clays, which have a moderately low permeability. Soils are discussed in greater detail in Section 2.3.4. The vegetation on the site, predominantly native grasses and forbs as discussed in Section 2.3.5, promotes infiltration of surface water by maintaining soil porosity.

There is no permanent stream flow on the STM site. Only occasional low flow, derived from extended periods of precipitation or snowmelt during the late winter and early spring, is found in the drainage channels with seasonal springs evident along some of the mesa slopes.

Precipitation and exposure at the NWTC are similar to that found at the STM site. The NWTC also receives large amounts of solar radiation and dry winds.

2.3.4 Soils

There are several soil types on the STM site, as illustrated in Figure 2.5. The top of South Table Mountain is covered with Lavina Loam, a shallow, well-drained, clayey-alluvium loess. Soil thickness averages about 12.7 cm, underlain by about 17.8 cm of clay subsoil. Beneath this layer is the volcanic caprock of the mesa. The caprock is exposed over 5% to 10% of the mesa's surface. This soil has a high shrink-swell potential, and excavations necessary for construction would likely expose bedrock.

According to the U.S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS), the upper side slopes of South Table Mountain consist of extremely stony clay loams of the Leyden-Primen-Standley group (1983). These soils are limited in their suitability for development due to steep slopes, depth to bedrock, soil slippage, rockfall, shrink-swell potential, large stones, and low strength. Much of the remainder of the site, including the area designated for major development, has a deep, well-drained soil of calcareous, clayey material referred to as Denver clay loam. There are two smaller soil areas on the southwestern portion of the STM site. Leyden-Primen-Standley cobbly clay loams with 9% to 15% slopes underlay the extreme southwest corner of the site. This soil group is characterized by slope, depth to bedrock, shrink-swell potential, large stones, low strength, and low permeability. The soils are typical of the area and fall into the NRCS Hydrologic Soils Group C, which indicates soils with relatively low infiltration and high runoff potential. Immediately east of this area is a small area of Standley-Leyden-Primen very stony clay loams with 15% to 30% slopes. While somewhat steeper than the cobbly clay loams to the west, this soil group has many of the same characteristics, including slope, depth to bedrock, soil slippage, rockfalls, shrink-swell potential, large stones, and low strength. On the eastern border of the STM site, along the ridges east of the main drainageway, area Denver cobbly loams with 5% to 9% slopes. This soil has some of the same characteristics of the other area soils (shrink-swell potential, low strength, slow permeability, and large stones).

Figure 2.5 Soil Types at South Table Mountain Site

Soil over the majority of the NWTC site is very cobbly sandy loam (USDA Natural Resources Conservation Service, 1983). It is a deep, well-drained soil that is typically very gravelly to cobbly for about the top 13 inches. The subsoil is very gravelly clay to gravelly sandy clay.

2.3.5 Vegetation

The DWOP has been fully landscaped with irrigated lawns, flower beds, shrubs, and selected ornamental, deciduous, and evergreen trees.

NREL conducted a vegetation survey of the entire STM site during the summers of 1992, 1993 and 1994. Two primary ecotones were identified on the STM site: grasslands and shrublands. The following is a general description of these vegetation community types.

Grasslands: The most common plant communities on the STM site are mixed grasslands. They comprise more than 80% of the vegetation on the site. These communities are generally dominated by shortgrass and mid-grass communities. The open mesa is dominated by shortgrasses, primarily blue grama *(Bouteloua gracilis)*, buffalo grass *(Buchloe dactyloides)*, squirreltail *(Sitanion longifolium)*, and red three-awn *(Aristida longiseta)*. The adjoining slopes and open meadows are dominated by mixed shortgrass and mid-grasses. Typical grasses can include western wheatgrass *(Agropyron smithii)*, green needlegrass *(Stipa viridula)*, and needle-and-thread grass *(Stipa comata)*.

Shrublands: Two primary upland shrubland communities occur on the STM site: mountain mahogany shrublands and shrubland occurring in drainages lacking active channels. Riparian shrublands are also found along drainages and are associated with spring-fed channels. The mountain mahogany shrubland is found on the shallow soils of the mesa, particularly in areas of exposed volcanic rock. The upland shrubland communities occurring along gullies and drainages are dominated by a number of shrubs that can form dense thickets. Common shrubs include chokecherry *(Prunus virginiana)*, bitterbrush *(Purshia tridentata)*, gooseberry *(Ribes inerme)*, hawthorn *(Crataegus erythropoda)*, smooth sumac *(Rhus glabra)*, skunkbush *(Rhus trilobata)*, and wild plum *(Prunus americana)*. These shrubs can also be found in drainages with associated wetlands, as described below.

Recent field surveys have identified limited wetland/riparian areas along drainages. These areas do not meet the criteria for delineation as wetlands and are therefore not regulated. These areas exhibit only some "wetland" characteristics, based on the U.S. Fish and Wildlife Service guidelines for delineation of wetlands. The wetland communities identified on the STM site are a very minor component of the total vegetation cover, accounting for less than 1% of the vegetation. All wetlands at the site are considered palustine/persistent/emergent wetlands and total less than 0.75 acre. The communities are dominated by spike rushes, several sedge species, and wetland grasses. Common species may include baltic rush *(Juncus balticus)*, Nebraska sedge *(Carex nebraskensis)*, and Canada bluegrass *(Poa compressa*). Wetland forbs include American brooklime *(Veronica americana)*, hemlock *(Conium maculatum)*, marsh elder *(Iva xanthifolia)*, and field mint *(Mentha arvensis)*.

Riparian shrub communities also occur adjacent to the emergent wetlands. These shrub communities can form dense thickets within the confines of the drainage. The most common shrubs in these areas include snowberry *(Symphoricarpos albus)*, currant *(Ribes cereum*), wild plum, chokecherry, and smooth sumac. Understory vines can include poison ivy *(Toxicodendron rydbergii)*, western virgin's bower *(Clematis ligusticifolia)*, and Virginia creeper *(Parthenoassus inserta)*.

A reconnaissance vegetation survey was conducted at the NWTC during the summer of 1994 to verify that existing botanical data for the site were correct. While vegetation types proved to be consistent with previously mapped data, invasion of knapweed and other noxious weeds has been extensive. Detailed mapping of the infestation of knapweed is scheduled for the summer of 1995, and control strategies are being jointly developed with Jefferson County Open Space, City of Boulder Open Space, Boulder County Open Space, and the Rocky Flats Environmental Technology Site (RFETS).

2.3.6 Wildlife

The STM site represents an island of relatively undisturbed native range habitat compared to nearby segments of urban development. Livestock grazing is not authorized on any of the NREL sites. A wildlife survey was conducted on the STM site during 1986 and 1987. The only large mammals seen using the site during the survey were mule deer. Medium-size carnivores observed include coyotes, gray and red fox, raccoons, long-tailed weasels, striped and spotted skunks, badgers, bobcats, and mountain lion. Medium-sized herbivores are also found on the site, primarily rabbits as well as some yellow-bellied marmots. Small mammals on the site include prairie voles, two mouse species, and busy-tailed woodrats. Seventeen species of birds were observed during the survey of the STM site, along with two species of raptors: kestrels and two nesting pairs of red-tailed hawks. NREL personnel have reported sighting a golden eagle. Numerous sightings of snakes have also been reported by NREL personnel. A variety of amphibian species are expected to inhabit the area. No upland game, threatened, or endangered species were observed on the STM site during the year-long wildlife survey. No significant impacts have been observed on any of these species due to NREL's operations from its existing facilities.

The wildlife of greatest interest at the NWTC are the avian species. For the past two years, NREL has conducted four-season surveys of the site to evaluate usage by raptors and other birds of prey. Field observations, made a minimum of three times per week at different time periods, evaluated use of the area for perching, nesting, hunting, loafing, and as a flightway. While a variety of birds use the site, there do not appear to be any long-term residents. No interactions with the turbines or meterology towers have been observed to date.

Large mammals identified on the site include mule deer and black bear. Medium-size carnivores observed include coyotes, gray and red fox, raccoons, long-tailed weasels, striped and spotted skunks, badgers, and mountain lion. Medium-size herbivores are also found on the site, primarily rabbits. Small mammals on the site include the prairie vole, two mouse species, and the bushy-tailed woodrat. Numerous sightings

of snakes have also been reported by NREL personnel. No upland game, threatened, or endangered species have been observed on the NWTC site, although Prebbles' jumping mouse may inhabit adjacent riparian areas. No significant impacts have been observed on any of these species due to NREL's operations from its existing facilities.

2.4 Historical Environmental Highlights

Since the beginning of its operations in 1979, NREL has demonstrated responsible stewardship of all facets of the environment. Table 2.1 outlines the significant environmental activities at NREL from its inception in 1974 through 1994.

2.5 Demographic Information

According to 1990 census data, the six-county Denver metropolitan area, which includes the counties of Denver, Boulder, Jefferson, Adams, Arapahoe, and Douglas, had a population of 1,848,319. The six-county population is expected to increase to approximately 2,093,977 by 2000. The 1990 population of Jefferson County was 438,430, an increase of 17.9% over 1980, and Golden had a population of 13,116, representing an increase of 7% over the 1980 figures. Similarly, Jefferson County is expected to flow to a population of 485,048 by 2000.

During most of the 1980s, the unincorporated portion of the region grew more rapidly than municipalities. Scattered, low-density urban sprawl has become a dominant feature of the area's landscape and is expected to characterize future regional growth.

From the developed portion of the STM site, it is approximately 275 m to 300 m (900 ft to 1000 ft) to the nearest residence, 0.8 km (0.5 mi) to the nearest office building, and 0.8 im (0.5 mi) to the nearest school. Continued operation of the STM site is unincorporated Jefferson County is not expected to have a significant impact on the surrounding population.

The NWTC is located several kilometers from the nearest residence, office building, or school. Continued operation of the NWTC site in unincorporated Jefferson County is not expected to have a significant impact on the surrounding population.

2.6 Land Use

The 300-acre STM site is bordered predominantly by open grassland zoned for recreation and light commercial activity. A vacant parcel of Camp George West is located adjacent to and south of the central portion of the STM site. Portions of the community of Pleasant View are located immediately to the south and west of the western portions of the STM site. Offices, shops and a tree nursery owned by the Colorado

State Forest Service are located at the far western edge. Undeveloped state land and a Colorado State Highway Patrol pursuit driver training track are located along the northwestern boundary of the STM site. Jefferson County Open Space wraps around the northern and the eastern edge of the site. Portions of the DWOP, currently undeveloped but planned for commercial expansion, lie to the east. The community of Applewood is located 2.4 km to the east. Figure 2.6 illustrates general land use in the vicinity of the STM site. Figure 2.7 is the site plan for the STM site showing existing land use. The DWOP is a relatively flat, landscaped office complex occupied by a number of four-story buildings, parking lots, and common areas. NREL-leased facilities at DWOP are located approximately in the geographic center of the developed commercial Denver West Office Park. The DWOP is bordered on the south by commercial areas (West Colfax strip); on the west by the Pleasant View residential area, Camp George West and the STM site; open space and the Applewood residential area on the north; and Applewood and Lakewood residential areas to the east. The JSF is located in a commercial area surrounded by agricultural land.

The NWTC facility occupies a 280-acre flat area approximately 1844 m in elevation. Most of the area surrounding NWTC is open grazing land, with the exception of operations at the RFETS, which borders NWTC to the southeast. A gravel quarry borders the NWTC to the southwest.

2.7 Topography

The STM site and DWOP are approximately 4 km east of the front range of the Rocky Mountains. The STM site is situated on the top and south-facing slopes of South Table Mountain, an isolated mesa that stands about 150 m above adjacent valley areas. The mesa top of South Table Mountain slopes gently to the south. A prominent cliff rims the top, ranging from approximately 9 m high on its south side to more than 45 m high on the north side. Elevations on the STM site range from 1743 m above sea level (near the southeast corner) to 1844 (at the northernmost point), a difference of 101 m. Most NREL facility developments are located on the base and lower slopes, approximately 60 m below the mesa rim.

The DWOP is a level area about 1.6 km (1 mi) southeast of the STM site. The JSF is on a level site adjacent to a surface stream. The majority of the NWTC site is level. The land slopes off into a natural drainage on the northeast corner of the site.

2.8 Climate

The climate of the geographic region of NREL operations is classified as semi-arid, typified by sparse precipitation, low relative humidity, abundant sunshine, and large daily and seasonal temperature variations.

The area receives moderate precipitation, with average annual rainfall less than 50 cm (20 in). Almost half of the annual precipitation occurs from March to June. Summer showers contribute 33% of the annual precipitation total. Precipitation begins to decrease significantly in the fall and reaches the minimum during winter. Less than 10% of the annual precipitation occurs in winter, primarily in the form of snowfall. Spring is a season of unstable air masses with strong winds along the foothills and the Front Range. The highest average snowfall occurs in March, and the NREL sites generally experience at least one heavy snowstorm with snowfall totals exceeding 15 cm to 25 cm (5 in to 10 in).

Table 2.1 Historical Environmental Highlights at NREL (formerly SERI)

Year	Event
1974	Solar Energy Research Institute (SERI) conceived
1977	Original contract awarded to the Midwest Research Institute
1978	Denver West Office Park (DWOP) buildings retrofitted to accommodate SERI
1979	First field experiments conducted near South Table Mountain (STM) site
1979	Site-wide archaeological survey completed at STM site
1979	Flora and fauna surveyed at STM site
1979	Building 16 occupied for research purposes
1979	Hydrology field survey of STM site
1979	Geotechnical investigations of STM site
1980	SERI is issued Hazardous Waste Generator ID number for Building 16 by the State of Colorado
1980	SERI initiates ambient air monitoring system
1980	SERI completes Environmental Assessment (EPA) for development of STM site: Finding of No Significant Impact (FONSI) issued
1982	Modular Industrial Solar Retrofit (MISR) site constructed
1982	Construction of Field Test Laboratory Building (FTLB) begins
1982	SERI initiates off-site domestic well-sampling programs
1982	Chemical "catch tank" installed adjacent to Building 16
1984	Construction of FTLB completed
1985	SERI initiates Biotechnology Research Facility (BTRF) wastewater monitoring
1985	SERI issues first annual Site Environmental Report
1986	SERI terminates ambient air monitoring program
1986	SERI terminates off-site domestic well sampling program
1987	SERI conducts grab sample wastewater monitoring
1987	DOE conducts environmental survey
1987	Fauna resurveyed at STM site
1987	Historical review of SERI STM site
1988	SERI is issued Hazardous Waste Generator ID number for the STM site by the State of Colorado
1988	SERI completes EPA update for continued development of STM site: original FONSI validated by the DOE Office of Environment, Safety and Health
1988	SERI constructs facilities and bulk storage buildings
1988	SERI completes environmental Preliminary Assessment of the STM site and submits to EPA
1989	Environmental memorandum-to-file approved for construction of High-Flux Solar Furnace (HFSF)
1989	HFSF constructed on STM site

1990 MISR site and Colorado National Guard pistol range building demolished
1990 SERI installs on-site groundwater monitoring network and initiates groundwater monitoring program
1990 Removal of concrete rubble from ravine and restoration of vegetative cover
1991 Removal of chemical catch tank adjacent to Building 16
1991 Construction of Waste Handling Facility
1991 Demolition of test house at Field Experiment Test Area site
1991 Visit by DOE Tiger Team
1991 SERI is designated the National Renewable Energy Laboratory (NREL)
1991 Site assessment for decommissioning of wastewater sump at BTRF begins
1991 EPA prepared for construction of the Solar Energy Research Facility (SERF) building
1991 Initial draft of policies and procedures prepared for implementation of the National Environmental Policy Act (NEPA)
1991 Permanent staff added for hazardous waste coordination/management and implementation of NEPA
1992 Two underground storage tanks removed at STM site
1992 Sampling and characterization performed on former Colorado National Guard shooting range
1992 Shooting range remediation begins (completed in 1993)
1992 New site-wide EPA prepared for STM site
1992 Concrete wastewater sump adjacent to BTRF decontaminated and removed
1992 Three environmental monitoring programs commenced: PM-10 (particulate) ambient air, wastewater and storm water monitoring
1992 Process improvement team for chemical management initiated
1992 Waste Minimization Panel established
1992 New policies and procedures initiated for implementation of NEPA
1992 Three features of historic significance on STM site nominated by NREL for National Register of Historic Places
1993 Shooting range remediation completed
1993 DOE/GO assumes responsibility for National Wind Technology Center (NWTC)
1993 PM-10 ambient air monitoring of SERF construction site completed
1993 Water supply well at NWTC sampled
1993 Surface soil at NWTC sampled prior to excavation of proposed septic leach field site
1993 Site-wide soil sampling project of surface soils begins at NWTC
1993 Three groundwater wells at the STM site permanently closed
1993 Laboratory-wide electronic chemical management system implementation begins
1993 Leak test of FTLB underground storage tank for emergency generator fuel storage
1993 Phase II of 3-year botanical survey of STM site completed
1993 Construction of SERF completed and occupancy begins
1993 Construction initiated and/or completed on the following projects: Alternative Fuels User Facility, Pilot Demonstration Unit construction, Denver West Parkway extension to Quaker Street, utility spine between FTLB and BTRF, NREL Visitors Center, and Denver West Parkway widening at STM site entrance

1993 Temporary Colorado Department of Public Health and Environment ozone monitoring station installed at NREL's Solar Radiation Research Laboratory
1993 Completed storm water characterization sampling at STM site
1993 Completed PM-10 ambient air monitoring in support of SERF construction
1994 Leak test performed on FTLB underground storage tank used for emergency generator field storage
1994 Initiated NWTC reconnaissance vegetation survey
1994 Initiated survey of avian species at NWTC
1994 Completed routine groundwater monitoring at the STM site
1994 Completed routine laboratory wastewater effluent monitoring
1994 Cleaning and removal of Building 15 photography lab wastewater sump at DWOP
1994 Wastewater effluent compliance sampling in photography lab
1994 Completed historical land use study of the NWTC

The solar radiation (sunlight energy) climate of the region is excellent for outdoor research and testing of solar energy conversion devices and systems. Sunshine is abundant throughout the year and remarkably consistent from month to month and season to season. The Golden area is especially suitable for solar energy research, as high insolation rates and season changes make the site ideal for outdoor research, and test results are applicable nationwide.

Wind velocities along the Front Range of the Rocky Mountains are frequently very high, usually reaching 130 kph to 160 kph (80 mph to 100 mph) several times each year at the NWTC. This contributes to a favorable climate for performing wind research as well.

Figure 2.6 Land Use in the Vicinity of the South Table Mountain Site

Figure 2.7 Land Use at the South Table Mountain Site

3.0 COMPLIANCE SUMMARY

January 1, 1994 through December 31, 1994

3.1 Comprehensive Environmental Response, Compensation and Liability Act (CERCLA)

Many sections of CERCLA do not apply to NREL as no hazardous waste sites have been identified on any of the Laboratory sites. However, NREL is subject to the emergency reporting requirements in Title III of the Superfund Amendments and Reauthorization Act (SARA). Section 3.10 describes NREL's SARA compliance for 1994.

NREL is also subject to Sections 102, 103 and 304 of CERCLA, which require the reporting of any releases of "reportable quantities" of chemicals. During 1994, the Laboratory had no releases to the environment of chemicals reportable under this section.

3.2 Resource Conservation and Recovery Act (RCRA)

The State of Colorado has primacy over the RCRA program. NREL has four waste generator identification numbers issued by the State of Colorado, as required by RCRA. The facility disposes of its waste at EPA-permitted facilities under these four numbers.

It is NREL's policy to have the majority of its RCRA-regulated wastes incinerated, rather than landfilled, in order to more completely destroy the hazardous constituents and minimize any potential for future public exposure. Generators are classified as large quantity, small quantity or small quantity conditionally exempt by site, based on the amounts of waste that are generated each month at the site. Because the quantity of waste generated by the Laboratory at the STM and DWOP sites is normally below 1000 kg per month, these two NREL sites are considered small quantity generators (SQG), according to the regulations. Two of NREL's sites, the NWTC and JSF, generate less than 100 kg per month and are therefore conditionally exempt SQG sites. Conditionally exempt SQGs are not required to meet many of the administrative and record-keeping requirements that other classifications of generators must meet.

NREL has adopted a conservative waste disposal policy in which materials that are not regulated by RCRA, yet might pose or be perceived to pose a potential hazard, are collected and disposed at nonregulated material at a RCRA-permitted disposal facility. In addition, NREL incorporates waste minimization practices into its activities whenever possible to minimize the volume and/or toxicity of waste generated by its activities.

3.3 Federal Facilities Compliance Act (FFCA)

As it applies to the management of solid waste, the United States expressly waived sovereign immunity in the FFCA. Because NREL is a federal facility, this waiver of immunity applies to all waste operations at the Laboratory.

NREL has not had any Notices of Violation in the area of solid waste management (or any other environmental area), so the FFCA provisions for sanctions and penalties are not applicable to NREL. NREL does not generate or store any mixed waste, so the mixed waste requirements in Section 105 of the FFCA do not apply. More information about solid waste management at NREL is provided in Sections 3.2 and 4.4.

3.4 National Environmental Policy Act (NEPA)

There were no environmental impact statements produced at NREL in 1994. Preparation of a site-wide for the NWTC was begun in 1994, with completion scheduled for late 1995. As the NWTC has been in use for wind energy research since 1977, the proposed action for the EPA is continued use of the site for testing of renewable energy technologies, primarily in the area of wind research. In addition, some use of the space for warehousing and storage of NREL-owned equipment is also under consideration.

In addition, numerous environmental evaluations were completed in 1994 for which categorical exclusions were given (categorically excluded activities are those which by their nature have been determined by DOE to have no significant environmental impacts). Categorical exclusions were documented using the NEPA Determination Request (NDR) form. These environmental evaluations were performed for new research activities, and for subcontracted work, including minor site construction, modification and demolition projects, and research and development at non-DOE facilities. None were found to have a significant environmental impact. Where necessary, mitigation measures (such as erosion control measures for construction work) are being implemented to ensure that NREL activities create no significant impact.

Proposed projects are continuously evaluated for environmental impact, and NEPA reviews are performed as necessary. All purchases and subcontracts are evaluated for environmental impacts via a worksheet. Any procurement actions that have the potential for environmental impacts go through the more rigorous environmental evaluation process to determine the need for further NEPA evaluation.

3.5 Clean Air Act (CAA)

As NREL uses only small quantities of chemicals on a laboratory scale for its research and development activities, neither the EPA nor the State of Colorado issues permits for NREL's laboratory air emissions (CDPHE Regulation No. 3, Section II.D.1.i). Any air emissions generated by NREL's laboratory activities would be sporadic and in very small amounts. Two NREL research projects that are being conducted on a pilot scale have the potential to emit small quantities of reportable air emissions. One project, the pyrolysis experimental process, was initially exempted from permitting by CDPHE because it was experimental laboratory equipment. The pyrolysis process is now exempt from air emissions permitting by regulation because it processes less than 10,000 lb of material annually (CDPHE Regulation No. 3, Section II.D.1.i). The second, the biomass-to-ethanol process development unit (PDU), was granted an exemption by CDPHE in 1993 because it was expected to have emissions of any criteria pollutant of less than 1 ton per year (CDPHE Regulation No. 3, Section II.D.1.a).

Two of NREL's seven natural gas-burning boilers have CDPHE air emissions permits. The two boilers are regulated by conditions on the air emission permits which specify the type of fuel that may be burned as well as operating parameters. NREL operates its boilers according to permit specifications and only burns fuel allowed by its permits. These two boilers are inspected annually by the State of Colorado. New regulations that because effective in September 1993 raised the threshold for permitting of fuel-burning equipment; therefore, all seven NREL boilers are now exempt from permits due to their small size (5 CCR 1001-5), although the two existing permits were not automatically rescinded by the regulation.

NREL intents to submit sitewide fugitive dust permit applications for construction activities for the NWTC and STM sites. Construction projects planned through 1999 will be included in the applications. Permit conditions will be outlined in Fugitive Dust Control Plans for each site.

Title V of the CAA requires a major source of air pollutants to obtain an operating permit that establishes certain operating parameters for that source. A major source is one that has a "potential to emit" (PTE) 100 tons of any criteria pollutant, 10 tons or more of any hazardous air pollutant (HAP), or 25 tons or more of a combination of more than one HAP. The emergency generators at NREL's STM site rarely operate but have the capability to operate at very high power outputs with resulting air emissions. Due to the presence of these emergency generators, NREL's PTE exceeds the 100-ton threshold for Nox, although actual emissions are many times less. By regulation, a source may obtain a federally enforceable limit on its emissions by applying for a synthetic minor permit. The permit would prohibit emissions in excess of the limit. Therefore, NREL intends to seek a synthetic minor source classification pursuant to Title V of the CAA.

Some air monitoring has been performed by NREL in the past. Ambient air particulate monitoring was begun in May 1992 and continued through the end of calendar year 1993 on the STM site to monitor potential impacts of SERF construction. No adverse impacts to ambient air quality from SERF construction were indicated by the monitoring.

3.6 National Emission Standards for Hazardous Air Pollutants (NESHAPs)

NESHAPs under the CAA require that all DOE facilities submit an annual report of radionuclide air emissions and public dose. The EPA maximum allowable radiation dose to any member of the public is 10 mrem/yr. There are no nuclear operations at NREL and only minor use of radioisotopes. Small quantities of radioisotopes are used for biological labeling in a few labs at the Field Test Laboratory Building (FTLB) on the STM site. Because NREL's use of radionuclides is minimal, no air monitoring for radionuclides is performed, and NREL demonstrates compliance with NESHAPs using EPA's COMPLY computer model. In using the computer model, NREL assumes that the entire quantity of all open containers of radionuclides opened during the calendar year are exhausted to the atmosphere, an extremely conservative assumption; the actual radionuclide air emission is orders of magnitude lower and is probably not even measurable. Therefore, COMPLY provides a very conservative estimate of effective dosage equivalent to the public. According to the COMPLY model, the total calculated potential dose to the public for all of NREL's 1994 air emissions is 0.0015 mrem/yr, well below the standard of 10 mrem/yr. Therefore, NREL is in compliance with the NESHAPs for radionuclides.

3.7 Clean Water Act (CWA)

NREL is currently classified as a nonindustrial water user because it discharges less than 25,000 gallons per day to the sewer system and its effluent does not contain any toxic pollutants as defined in Section 307 of the CWA, 33 U.S.C. 1251 *et seq*.

In order to demonstrate that NREL's wastewater effluent meets local publicly owned treatment works (POTW), state, and EPA standards, wastewater composite and grab samples were collected every calendar quarter from July 1992 through December 1994 at the DWOP and STM sites. NREL's discharges from Building 16 and the FTLB meet all regulatory standards.

The Building 15 photography lab wastewater sump was cleaned and removed in January 1994. Compliance monitoring of wastewater streams within the lab was conducted on a quarterly basis throughout 1994. A few wastewater streams are being collected for off-site disposal. No exceedence of the standards was noted after removal of the sump from those wastewater streams being discharged to the sewer.

3.8 National Pollutant Discharge Elimination System (NPDES)

NREL is not required to obtain an NPDES storm water permit for its normal activities, but such a permit is required for major construction activity. In 1994, coverage under EPA's general permit for storm water discharge associated with construction activity began for NWTC construction activities. A Storm Water Pollution Prevention Plan (SPPP) was written, erosion controls are implemented according to the plan, and periodic site inspections are conducted to ensure that the controls are functioning properly. Coverage under the general permit for the Solar Energy Research Facility (SERF) construction on the STM site ended on January 1, 1994.

The Laboratory does not have any point-source discharges on its site, and wastewater is discharged to a POTW. Therefore, NREL is not required to obtain an NPDES permit or monitor its effluent under the NPDES program.

3.9 Safe Drinking Water Act (SDWA)

SDWA standards provide a good benchmark by which to evaluate groundwater quality, because all groundwater could ultimately be used as drinking water. Groundwater monitoring, begun in 1990 on the STM site, was performed on a quarterly basis through the end of 1991. Beginning in 1992, sampling was performed annually with quarterly water level measurements through 1994. Sampling data since 1990 indicate that the groundwater beneath the STM site is uncontaminated and meets State of Colorado groundwater quality standards (5 CCR 1002-8, Section 3.11), as well as federal and state drinking water standards with only one exception (lead in the upgradient well MW-4 in 1994).

Beginning with the fourth quarter in 1991 sampling, all groundwater samples have been analyzed for an expanded list of organic compounds. Although no significant detections of volatile organics had been noted up until that time, given the extensive list of different organic compounds used by NREL (albeit in small quantities), the Laboratory made decisions to test for all possible compounds to confirm that NREL activities had not adversely impacted groundwater quality on the site. Groundwater has been found to be uncontaminated by any of the 147 organics tested. As a result of the lack of contamination found to date and the slow groundwater permeability and flow rates, routine groundwater sampling will be discontinued.

Domestic water for drinking and sanitary purposes is brought onto the NWTC site from a CDPHE-approved drinking water supply and stored in a new underground tank installed specifically for this purpose. The new drinking water facilities began operation in July 1994. All sampling and testing of the water supply is performed according to State of Colorado requirements. State standards have been met in all tests performed to date.

3.10 Superfund Amendments and Reauthorization Act, Title III

Section 302 (40 CFR 355.30) of these regulations requires a facility to notify the State Emergency Response Commission that it is subject to emergency planning and notification requirements if any chemicals in the facility's inventory are stored in quantities greater than prescribed threshold planning quantities (TPQs). NREL first became subject to planning and notification requirements in 1988.

Section 304 specifies reporting requirements in the event of a release of a reportable quantity (RQ) of any hazardous substance defined by SARA and CERCLA. In 1993, NREL had no release exceeding the RQ of any reportable material under Section 304.

SARA Section 311 and 312 (40 CFR 370) require that NREL provide Material Safety Data Sheets (MSDSs) for chemicals that are stored on-site in quantities greater than TPQs and provide inventory reporting for these same chemicals in the form of Tier I or Tier II reports to emergency planning and response groups. While NREL currently has no chemicals on-site that exceed permissible TPQs, the laboratory has submitted MSDSs and Tier II reports in the past when required. The statute does not require laboratory chemicals to be reported: Section 311(e)(4) states that "any substance to the extent it is used in a research laboratory...under the direct supervision of a technically qualified individual" is not considered a hazardous chemical for reporting purposes. However, NREL did provide emergency response and reporting information to the Local Emergency Planning Committee, the SERC, and the West Metro Fire Protection District in 1994.

SARA Section 313 (40 CFR 372) requires that a toxic chemical release inventory report (Form R) be filed with EPA for any chemical that is manufactured, processed, or otherwise used in quantities exceeding TPQs. As a research and development laboratory, NREL does not manufacture or process any materials, and during 1994, the Laboratory did not use any materials on the 313 list in quantities exceeding the 10,000-lb threshold planning quantity. Therefore, no reporting under Section 313 is required.

3.11 Toxic Substances Control Act (TSCA)

The majority of the new use and manufacturing regulations do not apply to research and development activities such as those conducted at NREL. Polychlorinated biphenyl (PCB)-contaminated equipment and transformers are defined by TSCA as materials with 50 ppm to 500 ppm PCB concentrations (materials with PCB concentrations greater than 100 ppm are considered "PCB-containing"). All of NREL's oil-containing transformers have either been tested or certified to contain less than 50 ppm; as such, they are non-PCB-contaminated and are not regulated by TSCA.

3.12 Federal Insecticide, Fungicide and Rodenticide Act

Those pesticides classified for restricted use must be applied by or under the supervision of a certified pesticide applicator. Applicators of unclassified pesticides or those pesticides classified for general use do not require certification. NREL routinely uses only the latter type of relatively low toxicity pesticides, so no applicator certifications are necessary for NREL employees. The Laboratory has written and follows a Safe Operating Procedure (SOP) for the use of pesticides and herbicides by NREL's Facilities Branch. (An SOP is written to describe controls for each experiment or operation at NREL, with special emphasis on environmental, safety and health hazards.) Subcontractors applying restricted-use pesticides must first provide NREL with documentation that they hold the proper applicator certification.

3.13 Endangered Species Act (ESA)

The ESA provides for the designation and protection of wildlife, fish, and plant species that are in danger of extinction, and preserves the ecosystems on which these species depend. A wildlife survey was completed on the STM site in 1987 (The FORUM Associates, Inc., 1987a), at which time no threatened or endangered species or candidate species for endangered designation were found. No threatened or endangered plant species are known to exist on the STM site. A complete vegetation survey of the STM site was completed in 1994. No threatened or endangered species have been identified to date on the STM site.

No threatened or endangered species of either plants or animals have been identified on the NWTC site. A vegetation survey to verify the accuracy of previously collected data was performed in 1994. A severe infestation of the noxious knapweed is currently being evaluated for control strategies. A study to assess avian use of the NWTC was also conducted during 1994, with no significant impacts being noted.

3.14 National Historic Preservation Act

Three historic resources have been identified on the STM site. Pursuant to the requirements of the National Historic Preservation Act, NREL has taken measures to protect these structures from damage, as detailed in the Laboratory's *Cultural Resource Management Plan* (SERI 1991). In addition, the paperwork necessary to nominate these structures to the National Register of Historic Places and the Colorado Register of Historic Places was filed, and the nominations were approved in 1993.

A cultural resources survey was conducted at the NWTC during 1994. Although the site is thought to be part of the Old Lindsay Ranch, no historic resources were identified on the site.

3.15 Executive Order 11988, "Floodplain Management"

According to maps generated by the Jefferson County Department of Highways and Transportation as part of its urban drainage studies, the STM site at NREL does not contain any floodplains. No floodplains have been identified to date at the NWTC.

As a best-management practice, however, all construction activities that may cross a drainage channel are designed to meet the 100-year flood control standards (designed to withstand the equivalent of a 100-year flood).

Potential impacts on floodplains, as defined in Executive Order 11988 and 10 CFR 1022, are assessed for every action undertaken by NREL at subcontractor facilities, through the use of the NDR Form.

3.16 Executive Order 11990, "Protection of Wetlands"

Limited wetland areas totaling less than 1 acre occur on the STM site in the drainage bottom located east of the SERF. These are narrow, linear wetlands supporting spikerush, baltic rush, sedges, bluegrass, hemlock, and field mint. These wetlands will be protected from impact as site development continues.

Wetlands management was taken into account when formulating the land use plan in Section 2(c) of the 1991 NREL Technical Site Information Plan for the STM site. Potential impacts on wetlands are assessed for every action undertaken by NREL, in compliance with 10 CFR 1022, including those at subcontractor facilities, through the use of the NDR Form.

Wetland areas at the NWTC are extremely limited in extent as well. These areas total less than 1 acre.

3.17 Current Issues and Actions

A site-wide soil sampling project was begun in 1993 and completed in 1994 at the NWTC to assess the characteristics of surface soils and to detect any need for further sampling and evaluation. The entire site was sampled by collecting samples within a regular grid pattern. Additional grab samples were collected in areas of concentrated site activity (for example, wind-turbine pad sites). No areas of suspected widespread contamination requiring additional sampling were identified.

Sampling, characterization, and lead removal were performed on a former Colorado National Guard shooting range on the STM site in 1992 and 1993. In 1994 the State of Colorado informed SERI by letter that it was satisfied with the project and that no further action was needed.

Process Improvement Team recommendations were issued for chemical management to streamline and standardize procedures to track chemicals used both in laboratories and for facilities operations. Several administrative changes have been instituted as a result of team recommendations, and an electronic database for laboratory-wide chemical tracking is currently being developed. A physical inventory of all laboratory chemicals began in August 1994 that included labeling all chemical containers with bar codes. Research staff started using the electronic chemical inventory system to locate existing chemicals, a waste minimization activity, in November 1994. An electronic purchase requisition that flags ozone-depleting substances was developed in December 1994.

A tightness test was performed on NREL's remaining underground storage tank that stores diesel fuel for the emergency generator at the FTLB on the STM site. No leaks were detected below the liquid line. The next tank tightness test will be performed in the summer of 1995. It is anticipated, however, that the tank will be removed and replaced with an aboveground storage tank during 1996.

NREL's internal waste management and minimization training program was further enhanced in 1994 with new course materials and a more effective presentation format. Waste tracking was also improved by including more information and more cross-referencing in the waste tracking database; additional data are now attached to each waste container as well. Additional initiatives in employee awareness include development of computer-based training. The current pollution prevention awareness program includes training on waste handling, waste minimization and methods to eliminate releases to air, soil, and wastewater. During 1994, NREL compiled and published a list of locations where NREL employees could dispose of household waste.

The final phase of a 3-year botanical survey was completed during the 1994 field season. Phase I of this research effort, conducted in 1992, identified the major flowering plants on the STM site. Phase II was designed to collect and identify the major grasses, and to begin to do some population density study work. During 1994, a general survey of the remainder of South Table Mountain was conducted to place the STM site in a more regional setting. This work is essential to ensure that accurate data is included in environmental site reports, technical site information documents, and environmental assessments, as well as to provide information for a national survey of prairie grassland communities.

Field research into avian use of the NWTC was conducted during 1994, in an effort to identify potential impacts to birds from wind turbine research. While several species of raptors, including red-tailed hawks, kestrels, and a great-horned owl were noted on the site, they were primarily transient in nature. The NWTC appears to be used primarily for loafing and hunting, although one pair of kestrels nested in an old concrete pole during the spring. Birds of prey of concern, such as eagles, generally fly in excess of 500 feet over the site.

Several construction projects on the STM, for which routine environmental compliance field inspections were performed, were initiated in 1994. The following projects were initiated and/or completed during 1994: Outdoor Field Test Facility and STM Site Entrance Building.

NREL provided a facility (space at the Solar Radiation Research Laboratory) to the State of Colorado for one of its temporary ozone monitoring stations. The station was operated throughout the summer of 1993, and became a permanent monitoring station in 1994. Maximum ozone levels detected at the NREL site were below the federal regulatory limit.

Laboratory moves from Building 16 into the newly completed SERF were begun in late 1993 and continued throughout 1994 as the new laboratories were ready. The Safety and Security Office (SSO) assisted with packaging and transportation of laboratory chemicals to ensure that these activities were conducted according to U.S. Department of Transportation requirements (49 CFR).

An assessment of NREL's environmental management programs was conducted in the fall of 1993 by the Office of Environmental Audit from DOE's Washington, D.C., headquarters. Buildings, laboratory facilities, boilers, monitoring and sample collection stations, hazardous waste and low-level radioactive waste storage areas, inactive waste storage sites, groundwater monitoring wells, and underground storage tanks were appraised for compliance with applicable environmental regulations. Six findings of noncompliance were made in the appraisal. All of the findings were administrative in nature, and none of the deficiencies identified had a significant impact on NREL's ability to provide adequate environmental protection at its sites. Many of the action plans to correct the findings were completed in 1993. During 1994, all but one of the remaining action plans were completed and closed. Corrective actions completed in 1994 that were related to this assessment include: 1) resolving waste storage and transportation issues; 2) preparing standardized environmental sampling procedures; 3) issuing an SSO Strategic Plan; 4) revising NREL's Environmental Monitoring Plan; and 5) establishing quality improvements to the Annual Site Environmental Report.